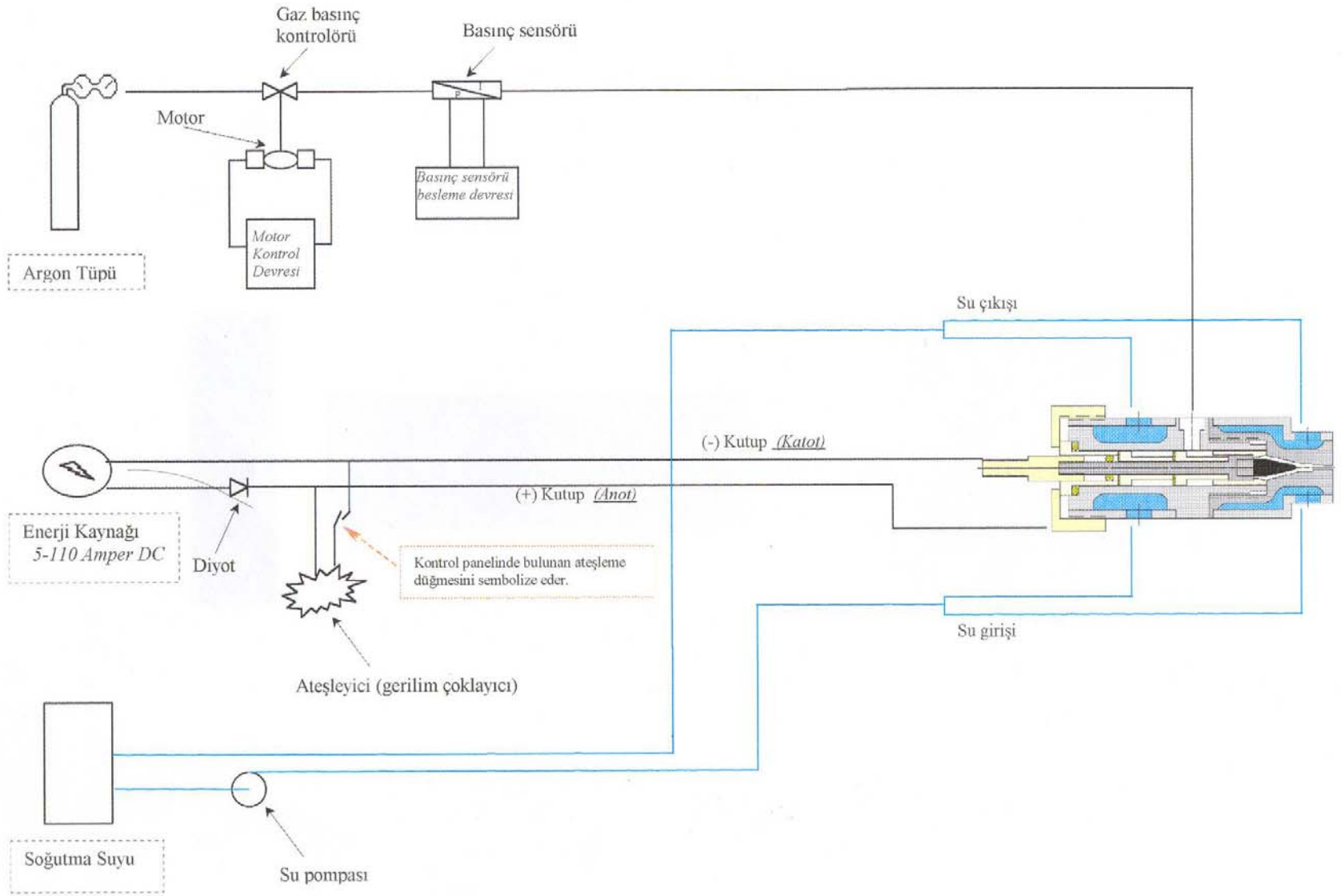


1 KW ARC-JET ENGINE: *EXPERIMENTS WITH ARGON*

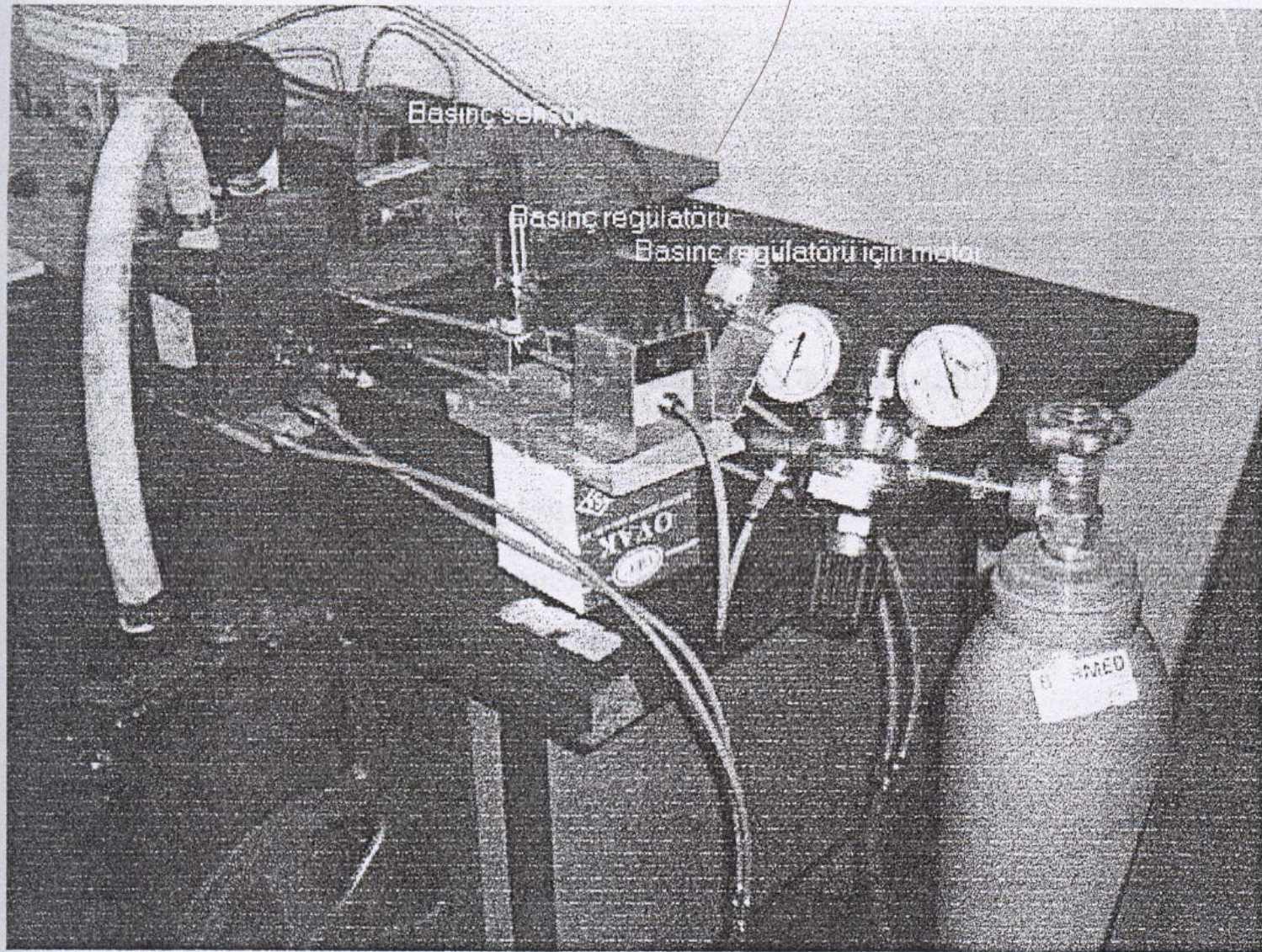
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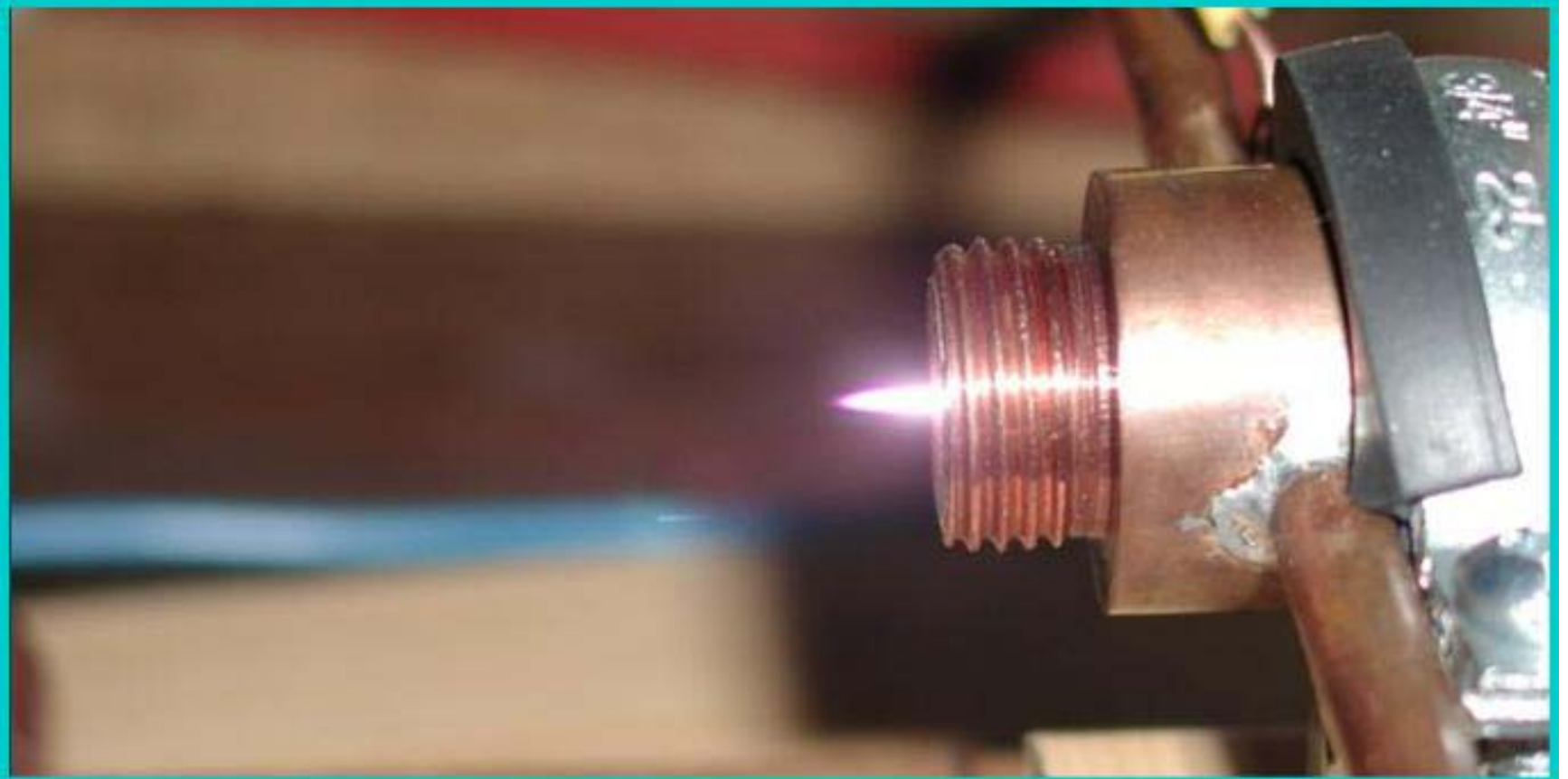
SYSTEM LAYOUT



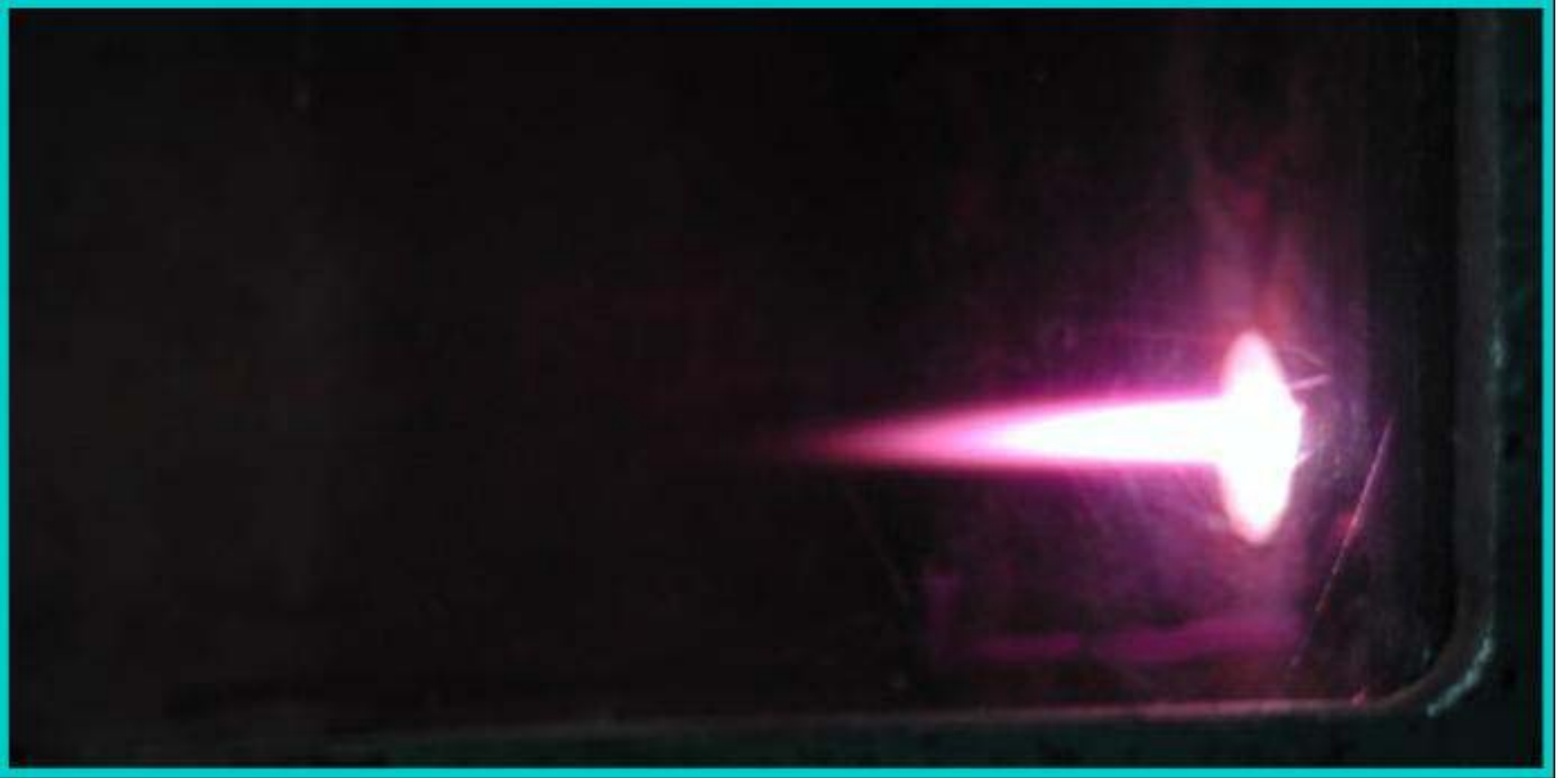
GAS SUPPLY SYSTEM



ELECTRICAL SYSTEM



MAIDEN FLAME



FLAME IN THE VACUUM

MASS FLOW RATE MEASUREMENTS

		23.11.2000	28.03.2001	20.04.2001	08.05.2001
0,625 atm	ϕ 0.25 mm	-		21 mg/s	
	ϕ 0.50 mm				80 mg/s
	ϕ 1.00 mm		321 mg/s		
1,25 atm	ϕ 0.25 mm	28 mg/s		29 mg/s	
	ϕ 0.50 mm				111 mg/s
1,875 atm	ϕ 0.25 mm	36 mg/s		36 mg/s	
	ϕ 0.50 mm				156 mg/s
2,5 atm	ϕ 0.25 mm	-		40 mg/s	
	ϕ 0.50 mm				180 mg/s
3,125 atm	ϕ 0.25 mm	-		62 mg/s	
	ϕ 0.37 mm		118 mg/s		
	ϕ 0.50 mm				260 mg/s
3,75 atm	ϕ 0.25 mm	69 mg/s		66 mg/s	
	ϕ 0.37 mm		141 mg/s		
	ϕ 0.50 mm				275 mg/s
4,375 atm	ϕ 0.25 mm	76 mg/s		75 mg/s	
	ϕ 0.37 mm		150 mg/s		
	ϕ 0.50 mm				293 mg/s
5 atm	ϕ 0.25 mm	80 mg/s		-	
	ϕ 0.50 mm				320 mg/s
5,625 atm	ϕ 0.25 mm	-		83 mg/s	
	ϕ 0.50 mm				345 mg/s
6,25 atm	ϕ 0.25 mm	101 mg/s		-	

VACUUM MEASUREMENTS

Gaz basıncı	Pasif Sistem	Aktif Sistem	
	Vakum ölçer	Ampermetre	Vakum ölçer
1 atm	50 mmHg	20 A	30 mmHg
1.625 atm	60 mmHg	20 A	30 mmHg
2.25 atm	85 mmHg	30 A	30 mmHg
2.875 atm	110 mmHg	30 A	40 mmHg
3.5 atm	130 mmHg	14 A	60 mmHg
		30 A	40 mmHg
		36 A	40 mmHg

COLD GAS MEASUREMENTS

<i>Basınç (atm.)</i>	<i>Debi (mg/s)</i>	<i>Kuvvet (gr)</i>	<i>Hız (m/s)</i>
0.625	80	1	125
1.25	111	2	180
1.875	156	4	256
2.5	197	5	253
3.125	260	7	269
3.75	275	9	327
4.375	293	10	343
5	320	11	343
5.625	345	12	347

CALCULATIONS (High Temp. limits)

Specific Heats: $c_p = c_v + R$, $c_v = (.) R$

$$V_e \cong \sqrt{2 c_p T_0}$$

Monatomic gas: $c_v = \frac{3}{2} R$

Diatomic gas: $c_v = \frac{7}{2} R$

Polyatomic gas: $c_v = \frac{3}{2} R + (3 \text{ s- } 5) R + R$ (linear)

$c_v = \frac{3}{2} R + (3 \text{ s- } 6) R + R$ (non-linear)

EXPERIMENTAL VALUES for ARGON (throat vel.)

$$P = 0.625 \text{ atm}$$

$$\dot{m} = 321 \text{ mg/s}$$

$$I = 8 \text{ A}$$

$$F = 0.15 \text{ N}$$

$$V_e = \frac{F}{\dot{m}} = 467 \text{ m/s}$$

$$P = I \times V = 8 \text{ A} \times 17 \text{ V} = 136 \text{ Watts}$$

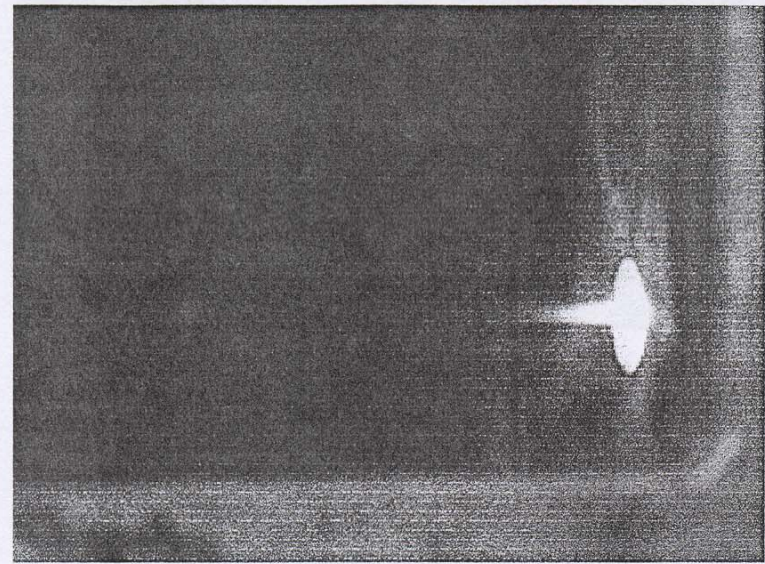
$$\eta = \frac{\dot{m} V_e^2}{2 P} = 25 \%$$

FLAME STABILITY

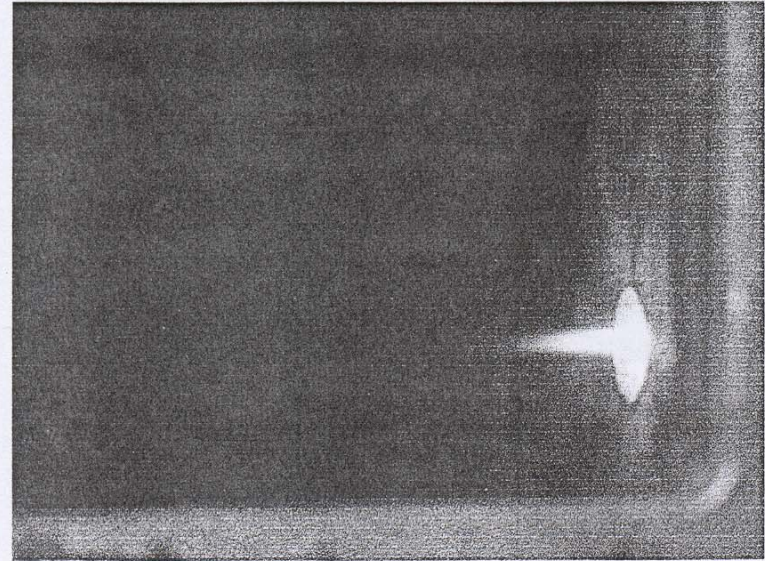
CHAMBER PRESSURE 1.0 - 1.625 atm

VACUUM PRESSURE 30 – 30 mmHg

FLAME LENGTH 28 – 33 mm

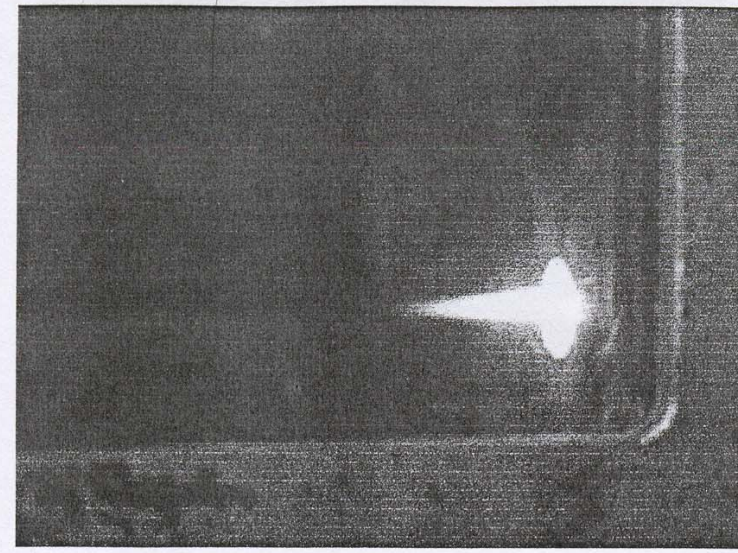


Şekil E.1. Gaz basıncı : 1 atm.
Dış basınç : 30 mmHg
Akım : 20 A
Alev boyu : 28 mm

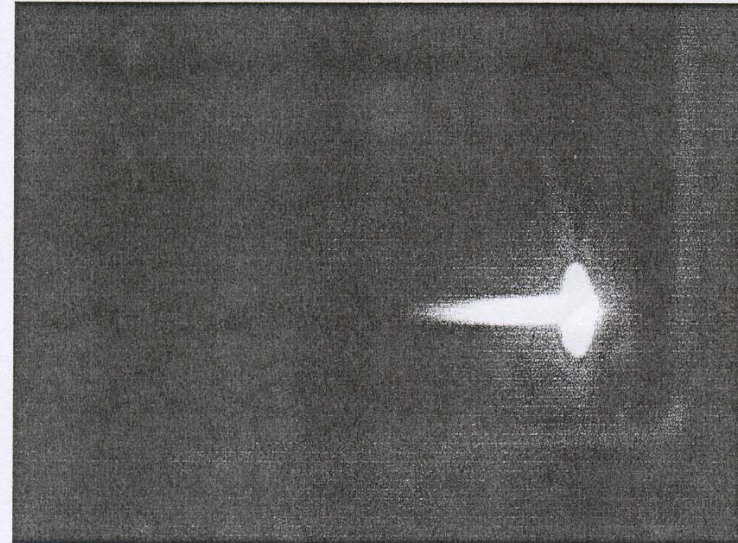


Şekil E.2. Gaz basıncı : 1.625 atm.
Dış basınç : 30 mmHg
Akım : 20 A
Alev boyu : 33 mm

CHAMBER PRESSURE 2.25 – 2.875 atm
VACUUM PRESSURE 30 – 40 mmHg
FLAME LENGTH 36 – 42 mm

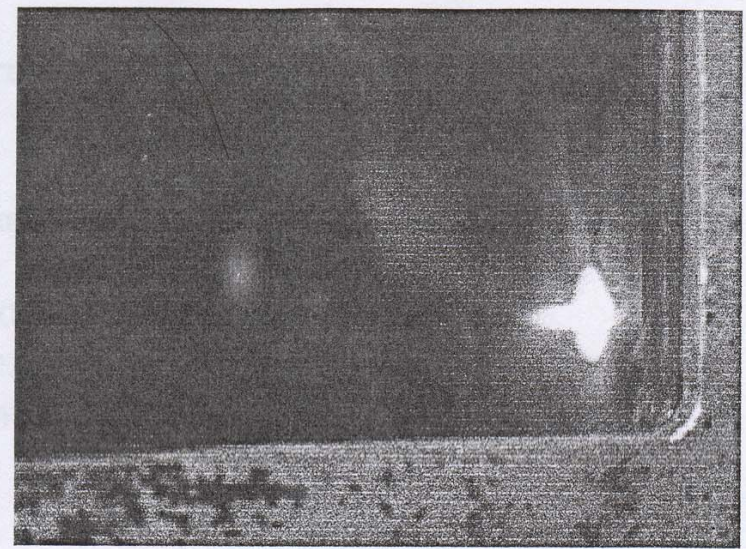


Şekil E.3. Gaz basıncı : 2.25 atm.
Dış basınç : 30 mmHg
Akım : 30 A
Alev boyu : 36 mm

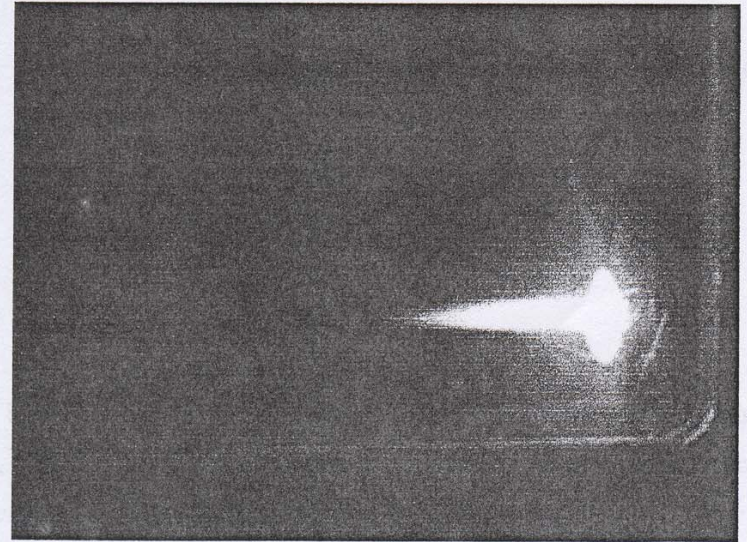


Şekil E.4. Gaz basıncı : 2.875 atm.
Dış basınç : 40 mmHg
Akım : 30 A
Alev boyu : 42 mm

CHAMBER PRESSURE 3.0 – 3.0 atm
VACUUM PRESSURE 60 – 36 mmHg
FLAME LENGTH 18 – 62 mm



Şekil E.5. Gaz basıncı : 3 atm.
Dış basınç : 60 mmHg
Akım : 14 A
Alev boyu : 18 mm



Şekil E.6. Gaz basıncı : 3 atm.
Dış basınç : 40 mmHg
Akım : 36 A
Alev boyu : 62 mm

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